U.S. Department of Transportation
Federal Aviation Administration

Memorandum

Subject:	Action: Review and Concurrence, Equivalent Level of Safety Finding for Gulfstream Model GV-SP FAA Project Number No. AT5177AT-T.	Date:	September 7, 2004
		Reg. Ref:	25.807(a)(3); 25.807(g)(1), (2), and (3); and 25.807(i)(1) and (2)
From:	Manager, Airframe & Cabin Safety, ANM-115	Reply to Attn of:	Joe Jacobsen, ANM-113
To:	Manager, Atlanta ACO, ACE-115A	ELOS Memo #:	AT5177AT-T-A-2

Background

Gulfstream aircraft have traditionally incorporated two pairs of overwing emergency exits, each being a 19" x 26" ellipse with its long axis parallel to the floor. Gulfstream proposed continuing the use of these exits on the GV-SP airplane, which is rated to carry up to 19 passengers.

The FAA determined that the GV-SP emergency exits would be subject to the requirements of § 25.807 at Amendment 25-98, which requires a Type III exit for an aircraft of this passenger capacity. The Type III exit is a rectangular opening, not less than 20” x 36”, with its long axis oriented vertically. As a result, there are two significant areas where the Gulfstream design differs from the regulatory requirements. First, although the Gulfstream models utilize two right side overwing emergency exits with a combined exit area of 776 square inches, the exit area offered by a single Type III exit (678 in^2) is approximately 75% greater than each single Gulfstream elliptical exit (388 in^2). It is therefore possible that some passengers who are able to extricate themselves through a Type III exit opening would be unable to fit though a Gulfstream exit because of their size or physical agility. Second, the horizontal orientation and the smaller size of the Gulfstream exits makes those exits more difficult to use, which could adversely affect passenger flow rate. Accordingly, the FAA required both of these issues (size and flow rate) to be satisfactorily addressed in order to determine an equivalent level of safety.

Applicable regulation(s)

§§ 25.807(a)(3), 25.807(g)(1), (2) and (3) and 25.807(i)(1) and (2)

Regulation(s) requiring an ELOS

§ 25.807 at Amendment 25-98

Description of compensating design features or alternative standards which allow the granting of the ELOS (including design changes, limitations or equipment needed for equivalency)

The following compensating features were determined to provide an overall evacuation capability for the GV-SP airplane that would be at least equivalent to that required by part 25:

- An additional crewmember (specifically designated as not having to be a fully qualified flight attendant) properly qualified for directing evacuation for flights with 10 to 19 passengers,
- A pre-flight briefing that explains the optimum method of evacuating through the elliptical exits for the various interior configurations,
- Flight crew must receive training in evacuation of the GV-SP airplane as a part of their type rating,
- A Type I entry door which is larger than a required Type II entry door,
- An excess pair of GAC elliptical exits on the left side of the airplane,
- Improved ditching characteristics,
- Lighter weight/smaller size elliptical exit hatches, and
- Passenger emergency briefing cards.

These compensating features would be required regardless of type of operation (i.e., Part 91 or Part 135). In addition, the GV-SP Type Certificate Data Sheet and Airplane Flight Manual (AFM) Limitations Section must document the following:

> *"A crewmember trained in evacuation is an additional required crewmember on all flights of 10 to 19 passengers. The required pilot and co-pilot cannot serve this function. The additional crewmember must be trained in the optimum method for evacuating through the Gulfstream elliptical exits and procedures for directing passenger flow to prevent someone who does not fit through an elliptical exit from blocking it so that others cannot use it. Each operator must establish and maintain a training program for this additional crewmember (to include an initial and recurrent curriculum) in accordance with Gulfstream Document G500-OMS-1, Revision 1, dated Sept. 1, 2004 (for G500 aircraft), or G550-OMS-1, Revision 1, dated Sept. 1, 2004 (for G550 aircraft), and must keep a record of that training available for inspection by the FAA.*
>
> *A pre-flight briefing on the configuration specific egress procedures and exits of the airplane must be provided to all passengers before each flight. This briefing must include a detailed explanation of the optimum method for evacuating through the overwing Gulfstream elliptical exits, which is dependant upon the interior configuration inboard of the exit."*

The following is required for the additional crewmember and each operator that is required to use an additional crewmember. (Note that the additional crewmember is referred to as an evacuation crewmember below.)

> Initial and Recurrent Evacuation Crewmember Testing Requirements
> No operator may use an evacuation crewmember, nor may any person serve as an evacuation crewmember unless, since the beginning of the 12th calendar month before that service, the operator has determined by appropriate initial and recurrent testing that the person is knowledgeable and competent in the following areas as appropriate to assigned duties and responsibilities:

(a) Authority of the pilot in command;
(b) Crewmember assignments, functions, and responsibilities during ditching and evacuation of persons who may need the assistance of another person to move expeditiously to an exit in an emergency;
(c) Briefing of passengers;
(d) Location and operation of all normal and emergency exits and related equipment;
(e) Seating of persons who may need assistance of another person to move rapidly to an exit in an emergency as prescribed by the operator's operations manual; and
(f) An understanding of the optimum, configuration specific, method for evacuating through the Gulfstream elliptical exits and procedures for directing passenger flow per Gulfstream Document G500-OMS-1, Revision 1, dated Sept. 1, 2004 (for G500 aircraft), or G550-OMS-1, Revision 1, dated Sept. 1, 2004 (for G550 aircraft)..

Evacuation Crewmember Training
(a) Each training program must provide emergency training for each aircraft configuration (i.e., training for directing passenger flow and using the optimum method for evacuating through the elliptical exits for the various interior configurations) and each kind of operation conducted.
(b) Emergency training must provide the following:
(1) Instruction in emergency assignments and procedures, including coordination among crewmembers;
(2) Individual instruction in the location, function, and operation of emergency equipment used in ditching and evacuation; and
(3) Instruction in the handling of emergency situations including ditching and evacuation.
(c) Each evacuation crewmember must perform at least the following emergency drills using a representative Gulfstream aircraft or Gulfstream cabin mockup training device:
(1) Ditching, if applicable;
(2) Emergency evacuation. This includes opening and egressing through a representative Gulfstream elliptical exit and conduct of an emergency evacuation drill to demonstrate directing of passenger flow per Gulfstream Document G500-OMS-1, Revision 1, dated Sept. 1, 2004 (for G500 aircraft), or G550-OMS-1, Revision 1, dated Sept. 1, 2004 (for G550 aircraft); and
(3) Operation and use of Gulfstream elliptical exits.

Evacuation Crewmember Initial and Recurrent Training Requirements
No operator may use a person, nor may any person serve, as an evacuation crewmember unless that person has completed the initial or recurrent evacuation crewmember training since the beginning of the 12th calendar month before that service.

Recurrent Training
(a) Each operator must ensure that each evacuation crewmember receives recurrent training and is adequately trained and currently proficient for the type aircraft and crewmember position involved.
(b) Recurrent ground training for crewmembers must include at least a quiz or other review to determine the crewmember's knowledge of the aircraft and crewmember position involved.

Explanation of how design features or alternative standards provide an equivalent level of safety to the level of safety intended by the regulation

The FAA found that an equivalent safety finding was justified based on testing conducted as part of the GV-SP certification program and the identification and implementation of the above listed compensating features. The compensating features were determined to provide an overall

evacuation capability for the GV-SP airplane that would be at least equivalent to that required by part 25

Design Features (Exit Size)

Number/type of exits – The Type I entry door and excess pair of Gulfstream elliptical exits on the left side of the airplane results in the left side of the airplane far exceeding the part 25 exit requirements. Part 25 requires only one exit on the left side of the airplane which is a Type II entry door (20" wide by 44" high). The Gulfstream configuration consist of a larger Type I entry door (24" wide by 48" high) and two additional non-required elliptical exits. This improves the overall evacuation capability of the airplane and is a more effective exit configuration for some accident scenarios. For example, the Gulfstream exit configuration would provide evacuation capability on the left side of the airplane if the entry door was jammed during an accident or was blocked due to an external obstruction. Occupants would be unable to evacuate on the left side of an airplane with the exit configuration required by part 25 for this scenario.

Improved ditching characteristics - The higher sill height of the Gulfstream elliptical window exits will provide a longer flotation time in the event of an emergency ditching scenario. (Note: This compensating factor is limited by the fact that most accidents do not involve a ditching event where improved flotation time would be useful.)

Weight and ease of operation – The relatively light weight and small size of the Gulfstream elliptical window exits will likely enable the exits to be opened and handled more easily than a Type III exit. (Note: Since other manufactures have produced Type III exits with weights comparable to that of the Gulfstream elliptical exits and since there is no standard for exit weight in the regulations, this aspect is considered to have minor benefit.)

Operational Features (Flow Rate):

An additional crewmember properly qualified for directing emergency evacuation for flights with 10 to 19 passengers - An extra crewmember properly qualified for directing emergency evacuation can significantly enhance the passenger evacuation of an airplane. Specifically, this crewmember could speed evacuation by opening an operable exit that is close to his/her station; shout instructions for passengers to open other exits; shout instructions to evacuees on the most effective technique for going through the elliptical exits; direct passenger flow away from inoperable exits to useable exits; and assist passengers in egressing through an exit.

Flight crew egress training as a part of their GV-SP type rating – Flight crew properly trained in evacuation of the GV-SP airplane is considered to provide compensation. However, the amount of compensation provided by this feature is limited by the fact that the flight crew has other duties to perform and therefore would not be immediately available in the event of an accident.

A pre-flight safety briefing prior to each flight – This will familiarize the passengers with the optimum method for evacuating through the emergency exit(s) of the aircraft on which they are flying (i.e., specific to that aircraft's interior configuration).

Passenger emergency briefing cards – These will supplement the pre-flight briefing and ensure that the exit information is readily available in the event of an emergency egress situation.

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety Finding for the GV-SP in Issue Paper A-2. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis section (TC's & ATC's) or on the limitations section of the STC Certificate. [e.g., Equivalent Safety Findings have been made for the following regulation(s): 25.807 Emergency Exits (documented in TAD ELOS Memo No. AT5177AT-T-A-2)].

Original signed by Franklin Tiangsing 4/21/04

Manager, Airframe & Cabin Safety, ANM-115 Date

ELOS Originated by:	Program Manager:	Routing Symbol:
Atlanta ACO	Neil Berryman	ACE-115A